

CHAPTER 2.5 - Relationship Between WET and Chemical-Specific Limits

The purpose of this chapter is to describe the differences between WET and chemical-specific applications, and to discuss reasons why they may be used separately or in place of one another.

NOTICE: This document is intended solely as guidance, and does not contain any mandatory requirements except where requirements found in statute or administrative rule are referenced. This guidance does not establish or affect legal rights or obligations, and is not finally determinative of any of the issues addressed. This guidance does not create any rights enforceable by any party in litigation with the State of Wisconsin or the Department of Natural Resources. Any regulatory decisions made by the Department of Natural Resources in any matter addressed by this guidance will be made by applying the governing statutes and administrative rules to the relevant facts.

A thoroughly integrated approach to water quality protection includes the use of limits on specific chemicals, an assessment of the aggregate effects of those chemicals when combined, and some monitoring of the aquatic life assemblages in the receiving water. The WDNR uses an integrated approach for controlling toxic pollutants that uses whole effluent toxicity (WET) testing and chemical-specific analyses to protect aquatic life. The use of WET testing is necessary in addition to chemical-specific testing due to several factors, including: 1) the limitations of chemical analysis methods (for instance, limits of detection may not be low enough to show whether standards are being met), 2) inadequate toxicity data for some chemicals, and 3) the inability to predict the toxicity of chemicals when combined in an effluent (i.e., water quality criteria for individual pollutants provide protection against these compounds individually, but do not account for the effects they may have when combined). In 1988 the WDNR began using WET testing, in addition to chemical-specific testing, to measure, predict, and control the discharge of materials that may be harmful to aquatic life.

WET Failures From Compounds Without WQC

Since WET testing has been included in WPDES permits, there have been occasions where a positive test result has been attributed to a compound or compounds that do not have promulgated water quality criteria (WQC). According to ch. NR 106, Wis. Adm. Code, permittees are responsible for their effluent's toxicity, whatever the cause. Chapter NR 106 states that "...substances shall not be present...alone or in combination...in amounts which are acutely [or chronically] harmful to aquatic life...".

The WET program has several major advantages over its counterpart chemical-specific approach with regards to water quality protection. Among the most important of those advantages is the ability of the WET test to evaluate the impact of all chemical constituents of an effluent. The entire chemical matrix has an effect on whether or not the organisms exposed to the effluent react in an adverse fashion. Using WET test procedures factors such as additivity, synergism, and antagonism are addressed without the need for expensive chemical analysis for a myriad of known and unknown chemical compounds.

Additivity: Occurs when the toxicity of chemical mixtures are greater than the exposure to each chemical individually, due to the sum of the toxic effects acting together (i.e., $1+1=2$).

Antagonism: The characteristic property of a mixture of toxicants that exhibits a less-than-additive total toxic effect (i.e., $2+2=3$).

Synergism: Occurs when the toxicity of chemical mixtures are greater than expected on the basis of exposure to each chemical individually (i.e., $1+1=3$).

Establishment of water quality criteria for chemical substances/compounds requires very controlled laboratory conditions, including the use of "clean" water to eliminate the risk of introducing bias. Because of that limitation, WET tests offer another major advantage in that they evaluate the potential for impact to a fish and aquatic life community by exposing the test organisms to a mix of clean laboratory water and natural receiving water when mixing zones are appropriate. These mixtures often contain ligands with binding sites for many compounds that help render them unavailable to sensitive aquatic life, thus changing the measured toxicity. Further, compounds with toxicity related to water quality may be released or sequestered by naturally occurring conditions of the effluent/receiving stream mix as appropriate.

Chemical-specific Limits in Lieu of WET Limits

There may be some instances where a chemical-specific limit can be established in lieu of a WET limit. For instance, if the permittee can, through the use of toxicity reduction evaluation/toxicity identification evaluation (TRE/TIE) procedures, identify and confirm the chemical(s) responsible for an effluent's toxicity, then a limit for the identified toxicant may be appropriate in lieu of a WET limit. The chemical in question would have to already have an established WQC or secondary value, according to ch. NR 106, Wis. Adm Code.

An example of this may be the Department's policy for addressing chloride toxicity in wastewaters. The ultimate goal of the policy is for dischargers to comply with water quality-based effluent limits (WQBEL) for chloride, however, in recognition of the impracticality of end-of-pipe treatment options for chloride, the rules allow permittees to perform a source reduction based schedule that works towards the WQBEL. When a permittee gets a source reduction based permit, s. NR 106.89, Wis. Adm. Code, allows permittees to demonstrate chloride is the source of WET. If chloride is the sole cause of WET, the Department may hold WET testing/limits in abeyance until source reduction measures are complete. (See Chapter 2.10 for more details.)